



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/370,178	08/09/1999	BIN LI	RO4474	7728

20779 7590 07/11/2003

SHAPIRO COHEN
P.O. BOX 3440
STATION D
OTTAWA, ON K1P6P1
CANADA

EXAMINER

YEH, EDITH M

ART UNIT	PAPER NUMBER
----------	--------------

2634

DATE MAILED: 07/11/2003

8

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/370,178

Applicant(s)

LI ET AL.

Examiner

Edith M Yeh

Art Unit

2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 May 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed May 8th, 2003 have been fully considered but they are not persuasive.

Regarding claims 1, 8, & 15, Hoeher discloses the method of steps: determining/providing the total probability/logarithmic probability ratio of reaching the state by each reaching probability and each symbol values/information *as claimed*. For iterating through each symbol/state/path is the nature of the algorithms (i.e. trellis decoder) used, and Hoeher operates the method on each symbol base, further updates the probability of each symbol with the limitation (the paragraph after equation 14, Hoeher).

Regarding claims 18-20, the primary object of the Belveze et al.'s invention is "propose a SOVA method of reasonable complexity, allowing an evaluation of likelihoods of symbols estimated by a Viterbi detector, and which brings little error probability degradation compared with the optimal case of the MAP algorithm" (column 3 lines 8-12 '574 B1). The probability algorithms/methods used in MAP are the candidates for the modification/detailing the Belveze et al.'s method (column 8 lines 5-45) to improve the evaluation.

2. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies as stated in the argument are *not recited in the rejected claim(s)*. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Art Unit: 2634

All rejections are remained.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 4-5, 8-9, 13, 15, & 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoeher ("TCM on Frequency-Selective Fading Channels" a Comparison of Soft-Output Probabilistic Equalizers", GLOBECOM '90, IEEE, DEC 1990) in view of Belveze et al. (U.S. Patent 6389574 B1).

Regarding claim 1, Hoeher teaches a modified SOVA (section 3.2) comprising steps of for successive symbol times, for each states of possible states of a trellis, each state being reachable via a plurality of possible paths associated with respective symbol values (Figure 2, page 379 right column lines 1-14): providing at least one vector of probabilities for respective symbol values for reaching the state by summing products of the probability of reaching the state via the respective paths as claimed (equation 13), and providing a probability for each symbol from respective symbol values (page 379, left column, the third and forth lines before equation 14), however does not specify the details of the determining the state probability. Belveze et al. teach a modified SOVA method for determining a probability of reaching the state via each transition path, and a total probability of reaching the state (column 3 lines 15-39). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate

Art Unit: 2634

the Belveze et al.'s method in Hoeher's SOVA (Soft-output Viterbi Equalizer) to bring little error probability degradation (column 3 lines 8-12).

Regarding claims 4 & 5, Hoeher teaches the symbol values have a plurality of q values in one vector of probabilities (page 379, left column, the last six lines), and least one provides logarithmic probabilities).

Regarding claims 8 & 13, the rejection of claim 1 applies to claim 8. Belveze et al.'s method is for Q -uplet of symbols and Q is an integer at least equal to 1, the q possible transition paths are at least 2.

Regarding claim 9, Hoeher discloses the probability vector provides logarithmic probabilities (page 379, left column, the last 6 lines and equation 15).

Regarding claim 15, Hoeher teaches a modified SOVA (section 3.2) comprising steps of updating for successive symbol times a vector of logarithmic probability ratios for each state at a respective time, each vector corresponding to a survivor path, each logarithmic probability ratio representing one of the M -ary (Figure 2, page 379, left column, equation 13 to 15), the M -ary includes the binary, however does not specify the details of the determining the state probability and the total probability of reaching the state. Belveze et al. teach a modified SOVA method for determining a probability of reaching the state via each transition path, and a total probability of reaching the state (column 3 lines 15-39), and indicate the Q -uplet of symbols where Q is an integer at least equal to 1, the value "0" or "1". At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the Belveze et al.'s method in Hoeher's SOVA (Soft-output Viterbi Equalizer) to bring little error probability degradation (column 3 lines 8-12).

Art Unit: 2634

Regarding claim 17, Hoeher discloses an Equalizer in Figure 1, however does not the detail of the decoder shown. Belveze et al. teach a decoder (84 FIG. 7) to carry out the method of 15. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the Belveze et al.'s decoder in Hoeher's Equalizer to have a reasonable complexity, and little error probability degradation SOVA decoder (column 3 lines 8-12).

5. Claims 2-3, 6-7, 10-12, 14 & 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoeher ("TCM on Frequency-Selective Fading Channels" a Comparison of Soft-Output Probabilistic Equalizers", GLOBECOM '90, IEEE, DEC 1990) in view of Belveze et al. (U.S. Patent 6389574 B1) as applied to claims above, and further in view of Hladik et al. (U.S. Patent 5721745).

Regarding claims 2 & 6, Hoeher does not specify a vector of probability ratios/logarithmic probabilities for the binary values. However Hladik et al. teach probability ratios (column 5 lines 1-7) and logarithmic probabilities (column 5 lines 7-11) for the binary values. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the probability ratio/ logarithmic probabilities taught by Hladik et al. in Hoeher's method as typical SOVA calculation (column 4 lines 66-67) and to gain computational advantages (column 5 lines 7-8).

Regarding claims 3 & 10, Hoeher does not specify a vector of probability ratios for the q values (as M-ary). However Hladik et al. teach probability ratios (column 4 line 66- column 5 line 7), at the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the probability ratios taught by Hladik et al. in Hoeher's method in the one vector

Art Unit: 2634

for each state comprising at least $q-1$ vectors of probability ratios as typical SOVA calculation (column 4 lines 66-67) and to gain computational advantages (column 5 lines 7-8).

Regarding claim 11, Hladik et al. further teach the logarithmic probability ratios (column 4 line 66- column 5 line 15). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the probability logarithmic probabilities taught by Hladik et al. in Hoeher's method to gain computational advantages (column 5 lines 7-8).

Regarding claim 12, Belveze et al. teach the Q -uplet of symbols where Q is an integer at least equal to 1. When $Q=1$ it is the binary (M -ary where M is 2) wherein $q=2$. The same rejection applied to claim 10 applies to claim 12.

Regarding claim 7, Hladik et al. teach two vectors of probabilities, one for each of the binary values (column 4 lines 11-13, column 5 lines 6-7). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the vectors of probabilities of binary symbols taught by Hladik et al. in Hoeher's method to have more efficient computation.

Regarding claim 14, Hoeher does not teach the normalizing the total probabilities, however Hladik et al. teach the normalizing the total probabilities (column 6 lines 49-63, column 8 lines 7-10 step (ii), column 9 lines 40-52). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the normalization in Hoeher's method to have better performance and efficient memory usage (column 2 lines 11-14).

Regarding claim 16, Hoeher does not teach the normalizing the probabilities, however Hladik et al. teach the normalization (column 6 lines 49-63, column 8 lines 7-10 step (ii), column 9 lines 40-52). At the time of the invention, it would have been obvious to a person of ordinary

Art Unit: 2634

skill in the art to have the normalization in Hoeher's method to have better performance and efficient memory usage (column 2 lines 11-14).

6. Claims 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Belveze et al. (U.S. Patent 6389574 B1) in view of Hladik et al. (U.S. Patent 5721745).

Regarding claim 18, Belveze et al. have all subject matter claimed except specify using logarithmic probabilities. However Hladik et al. teach using logarithmic probabilities (column 4 line 66-column 5 line 14). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use logarithmic probabilities taught by Hladik et al. to gain computation advantages and efficient storage usage (column 5 lines 7-10).

Regarding claim 19, Belveze et al. do not teach the normalizing the probabilities, however Hladik et al. teach the normalization (column 6 lines 49-63, column 8 lines 7-10 step (ii), column 9 lines 40-52). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the normalization in Belveze et al.'s method to have better performance and efficient memory usage (column 2 lines 11-14).

Regarding claim 20, Belveze et al. disclose a decoder arranged to carry out the method of claim 18 (84 FIG.7).

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO**

Art Unit: 2634

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edith M Yeh whose telephone number is 703-305-3416. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on 703-305-4714. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4800.

Edith Yeh
June 30, 2003


STEPHEN CHIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600